C L A I M S

1. A negative pressure attraction device characterized by comprising:

an attraction nozzle which includes an attracting portion having an air suction port and sucks in air from the air suction port to attract a part to said attracting portion;

a negative pressure supply unit which supplies a negative pressure for suction to said attraction nozzle; and

an attraction confirming sensor which measures a flow rate of air sucked in from the air suction port, and outputs an electrical signal indicating presence or absence of a part attracted to said attracting portion on the basis of the measured flow rate.

2. A negative pressure attraction device according to claim 1, characterized in that said attraction confirming sensor includes

a base arranged in a gas channel,

a heater formed as a thin film on a surface of said base,

a plurality of temperature sensors formed as thin films on said surface of said base, and

detection means for measuring a gas flow rate on the basis of a temperature distribution in the vicinity of said heater which is measured by said

temperature sensors.

3. A negative pressure attraction device according to claim 1, characterized by further comprising:

a valve which controls suction of air from said attraction nozzle using the negative pressure, and

an air suction passage which connects said attraction nozzle, attraction confirming sensor, valve, and negative pressure supply unit to each other.

4. A negative pressure attraction device according to claim 3, characterized in that said attraction confirming sensor includes

a flow sensor which detects a change in flow rate of air measured in said air suction passage between said valve and attraction nozzle, and

detection means for outputting an electrical signal indicating the presence or absence of a part attracted to said attracting portion on the basis of an output from said flow sensor.

5. A negative pressure attraction device according to claim 4, characterized in that said flow sensor detects a change in flow rate of air measured in a portion of said air suction passage which is in the vicinity of said attraction nozzle.

6. A negative pressure attraction device according to claim 1, characterized in that

said attraction nozzle includes a plurality of

attraction nozzles which suck in air through the air suction ports by sharing the negative pressure, so as to attract different parts, and

said attraction confirming sensor is provided for each of said attraction nozzles.

7. A negative pressure attraction device according to claim 1, characterized in that said attraction nozzle includes an air suction port which is provided to one open end and through which air is sucked in.

8. A negative pressure attraction device according to claim 7, characterized in that said attraction nozzle further includes an air suction hole in which a flow speed of air sucked in through the air suction port by the negative pressure becomes a sonic speed.

9. A negative pressure attraction device according to claim 7, characterized in that said attraction nozzle further includes an air suction hole which has a channel sectional area with such a size that a flow speed of air sucked in through the air suction port by the negative pressure becomes a sonic speed and in which an opening area of the air suction port changes in accordance with a state of a part attracted to said attracting portion.

10. A negative pressure attraction device according to claim 1, characterized in that

said attraction nozzle further includes an air suction hole which opens to the air suction port and guides air, sucked in through the air suction port, to a nozzle inner chamber of said attraction nozzle connected to and in contact with said negative pressure supply unit, and

said negative pressure supply unit generates a negative pressure with which a pressure at an upstream end of the air suction hole is substantially not less than twice a pressure at a downstream end.

11. An attraction confirming sensor characterized by comprising:

a flow sensor which, when a part is to be attracted to an air suction port of an attraction nozzle, measures a flow rate of air sucked in through the air suction port; and

detection means for outputting an electrical signal indicating presence or absence of a part attracted to said attracting portion on the basis of an output from said flow sensor.

12. An attraction confirming sensor according to claim 11, characterized in that

said flow sensor includes

a base arranged in a gas channel,

a heater formed as a thin film on a surface of said base, and

a temperature sensor formed as a thin film on

said surface of said base, and

said detection means measures a gas flow rate on the basis of a temperature distribution in the vicinity of said heater which is measured by said temperature sensor.

13. An attraction confirming sensor according to claim 11, characterized in that said detection means outputs an electrical signal indicating presence or absence of a part attracted to the attracting portion of said attraction nozzle on the basis of a change in flow rate of air measured in an air suction passage between said attraction nozzle and a valve which controls suction of air from the attraction nozzle of a negative pressure attraction device.

14. An attraction confirming sensor according to claim 13, characterized in that said detection means outputs an electrical signal indicating presence or absence of a part attracted to said attracting portion on the basis of a change in flow rate of air measured in a portion of said air suction passage which is in the vicinity of said attraction nozzle.

15. An attraction confirming sensor according to claim 11, characterized in that said detection means outputs an electrical signal indicating presence or absence of a part attracted to the air suction port on the basis of a change in flow rate of air sucked in through an air suction hole which includes an air

suction port of an attraction nozzle of a negative pressure attraction device as one open end, and

in which a flow speed of air sucked in through the air suction port becomes a sonic speed.

16. An attraction confirming sensor according to claim 11, characterized in that said detection means outputs an electrical signal indicating presence or absence of a part attracted to the air suction port on the basis of a change in flow rate of air sucked in through an air suction hole which includes an air suction port of an attraction nozzle of a negative pressure attraction device as one open end and

has a channel sectional area with such a size that a flow speed of air sucked in through the air suction port becomes a sonic speed, and in which an opening area of the air suction port changes in accordance with a state of a part attracted to said attracting portion of said attraction nozzle.

17. An attraction confirming sensor according to claim 13, characterized by further comprising a connector to be connected to said air suction passage.

18. An attraction confirming sensor according to claim 11, characterized by further comprising a board which mounts and holds said flow sensor thereon and which forms a wall of a channel.

19. An attraction confirming sensor according to claim 12, characterized in that said temperature sensor

includes

an upstream temperature sensor arranged on an upstream side of a gas flowing direction,

a downstream temperature sensor arranged on a downstream side, and

an ambient temperature sensor arranged near the upstream side of said base.

20. An attraction confirming sensor according to claim 12, characterized in that

said base has a cavity at a central portion thereof, and

a diaphragm which thermally insulates said temperature sensor and base from each other is further provided on the cavity.